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Nest Usurpation by Red-headed Woodpeckers in Southeastern Montana

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ABSTRACT.—Red-headed Woodpeckers (*Melanerpes erythrocephalus*) occasionally usurp nests of other species. I compared incidence of nest usurpation in logged and non-logged treatments in a burned ponderosa pine (*Pinus ponderosa*) forest in 2004 and 2005. I predicted that usurpation would occur more often on logged than non-logged sites because Red-headed Woodpeckers tend to nest in more open habitats. Red-headed Woodpeckers nested more often and usurped a greater proportion of host species in logged ($n = 6$) than non-logged ($n = 3$) areas, despite host cavities being more abundant on the non-logged treatment. Usurping Red-headed Woodpecker pairs initiated nesting earlier ($\bar{x}$ = 12 May ± 2 days) than pairs that excavated cavities (18 May ± 2 days) which implies an existing benefit to offset the cost of interspecific conflict. *Received 14 November 2005. Accepted 19 November 2006.*

Competition for nest sites is often intense among cavity nesting birds because potential sites are limited by specific habitat requirements, such as tree decay and stand density (Short 1979, Dobkin et al. 1997, Schepps et al. 1999, Hutto and Gallo 2006). Once a territory is obtained, nest cavity construction requires a substantial energetic investment with excavation ranging from 3 weeks for Hairy Woodpeckers (*Picoides villosus*) to over a year for Red-cockaded Woodpeckers (*P. borealis*) (Kilham 1983, Ligon et al. 1986). The high energetic investment appears offset by the high rate of reproductive success that cavity nests provide (Nice 1957, Oniki 1979).

Woodpeckers may reduce the cost of excavation by usurping cavities occupied by other species. Red-headed Woodpeckers (*Melanerpes erythrocephalus*) typically reuse or excavate their own cavities, but may occasionally usurp nests and consume eggs or nestlings of other cavity nesting species (Beal 1911, Schwab and Monnie 1959, Smith et al. 2000). The extent to which Red-headed Woodpeckers usurp nests rather than excavate their own has not been investigated.

Interspecific competition among cavity nesting birds can increase as nest site availability decreases (Brawn 1990, Lindell 1996). Red-headed Woodpeckers tend to nest in more open habitats (Smith et al. 2000) and greater density of woodpeckers in logged areas may result in limited nest site availability.

I recorded incidence of nest usurpation by Red-headed Woodpeckers as part of a 2-year study on the ecology of cavity nesting birds in a burned ponderosa pine (*Pinus ponderosa*) forest in southeastern Montana. The area had been logged in 2003 following a stand-replacement wildfire the previous year. Red-headed Woodpeckers began arriving on the study site in early May after most other cavity nesters had already completed cavity excavation and nest building.

The objective of this study was to compare incidence of nest usurpation by Red-headed Woodpeckers in logged versus non-logged post-fire treatments. I predicted that usurpation by Red-headed Woodpeckers would be greater in the logged than non-logged treatment.

METHODS

The study area was in a ponderosa pine forest ~40 km southeast of Ekalaka, Montana in the Long Pines unit of the Custer National Forest (45° 38′ N, 104° 11′ W). The study site (1,320 ha) is part of a larger forested area (28,368 ha) intermixed with pine savanna, open native grassland (*Achnatherum* spp., *Bouteloua* spp., *Carex* spp., and *Psuedoroegneria* spp.), and drainages dominated by green ash (*Fraxinus pennsylvanica*) and quaking aspen (*Populus tremuloides*). The area consisted of hills and rocky buttes (elevation 1,000–1,200 m) surrounded by lower elevation sagebrush (*Artemisia* spp.) shrubland, native grassland, and cultivated hayfields. Logged areas were treated in summer 2003 by removing all

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snags >25 cm diameter breast height (DBH). Snags were defined as any tree with <50% live green crown cover (U.S. Department of Agriculture 2003). Aspen and green ash trees were not harvested, and a 15-m no-cut buffer was left on either side of drainages to maintain watershed quality (U.S. Department of Agriculture 2003). Non-logged areas were not treated because of inaccessibility or excessive slope.

I examined incidence of nest usurpation by Red-headed Woodpeckers on logged (437 ha) and non-logged (444 ha) treatments from mid-April through 1 July in 2004 and 2005 (2 and 3 years post-fire). I recorded the number and status (alive or dead) of trees in circular plots (radius = 11.3 m) in 2005 to compare trees and snags per ha between treatments. I centered plots at random points (control: $n = 15$, salvage: $n = 19$) generated with a Minnesota Department of Natural Resources (DNR) extension for ArcView 3.0 software. Three subplots were arranged 120° from each other and 30 m from a central subplot (Martin et al. 1997).

I searched for nest cavities from 22 April to 1 July by using a random numbers table to place two plots (45–52 ha) in each treatment in 2004 and 2005. Landscape and salvage characteristics dictated the availability and size of contiguous search plots on the study site, which were smaller than the standard protocol for monitoring cavity nesting birds (200–400 ha) and likely reduced sample sizes (Dudley and Saab 2003). Plots were intensively searched every 1–2 days and nests were located by observing adults and systematically searching for cavities (Martin and Geupel 1993). Potential host species included Northern Flicker (*Colaptes auratus*), Hairy Woodpecker, Eastern Bluebird (*Sialia sialis*), Mountain Bluebird (*S. currucoides*), and European Starling (*Sturnus vulgaris*). I recorded the location of active nests with a Garmin E-trex Global Positioning System (GPS) receiver and flagged a bearing tree no closer than 30 m. Each cavity was visited every 3 days for up to 30 min, or until nest status (active or inactive) could be ascertained by observing an adult or nestling inside the cavity. I estimated nest phenology from courtship displays and duration of adult visits to the nest (courtship and egg laying vs. incubation), and food deliveries or nestling vocalizations (nestling stage) (Martin and Geupel 1993).

I monitored active cavities from time of location to completion of the nesting effort by observing nestling and adult behavior from >30 m. A nest was considered successful if fledglings were observed <20 m from the cavity, or if the fledgling date was known and the cavity did not show signs of predation (enlarged cavity entrance or feathers at base of tree) (Dudley and Saab 2003). Nests failed if predation was observed, or if nest stage was known and inactivity occurred before the likely fledgling date. Nest failures were probably underestimated because signs of predation are frequently not evident. A nest was considered usurped if Red-headed Woodpeckers were observed breeding in a cavity last used by a host species before fledging could have occurred. I estimated nest initiation for cavities discovered after the laying period by backdating from a known nest stage transition (Ehrlich et al. 1988, Martin et al. 1997). I did not examine nest success of Red-headed Woodpeckers because nest failures or fledglings were not observed before the survey period ended.

I pooled data from 2004 and 2005 and classified each Red-headed Woodpecker nest cavity as either usurped or excavated. I compared incidence of nest usurpation versus cavity excavation between salvage and control treatments with Pearson's Chi-square test. Sample sizes were small and I used Fisher's exact test to examine statistical significance. I also used a *t*-test to compare date of initiation for each Red-headed Woodpecker nest effort between pairs that usurped and excavated cavities.

RESULTS

The logged treatment contained fewer live trees ($\bar{x} = 3.1 \pm 1.3$ [SE]) and snags ($\bar{x} = 44.7 \pm 4.9$) per ha than live trees (12.2 ± 3.8) and snags (90.8 ± 8.5) on the non-logged treatment. Average size (cm) of green trees did not differ between treatments (logged: $\bar{x} = 5.5$ DBH $\pm$ 13, non-logged: 15.5 ± 18), but snags were smaller in logged ($\bar{x} = 16.7 \pm 1.9$) than non-logged (23.7 ± 3.7) areas. I located and observed 91 active nest cavities in 2004 and 2005. Red-headed Woodpeckers were the only species that nested more often in the logged than non-logged treatment (Table 1). Red-headed Woodpeckers accounted

TABLE 1. Number of observed nest cavities per species in salvage logged and non-logged treatments in a burned ponderosa pine forest, Custer National Forest, Montana, 2004 and 2005.

Species	Logged	Non-logged
Northern Flicker	6	6
Red-headed Woodpecker	20 (6)[a]	11 (3)[a]
Hairy Woodpecker	7	13
Eastern Bluebird	3	5
Mountain Bluebird	5	10
European Starling	2	3

[a] Red-headed Woodpecker nests acquired by usurpation.

for 65% (n = 11) of nest failures of other cavity nesters by depredating two and usurping nine nests. More nests were usurped in the logged (n = 6) versus unlogged (n = 3) treatment, but incidence of nest usurpation versus construction by Red-headed Woodpeckers was similar between treatments (χ^2 = 0.03, df = 1, P = 1.0). Nest cavities of potential host species were more abundant in the non-logged (n = 37) than logged treatment (n = 23). Thus, Red-headed Woodpeckers usurped a greater proportion of cavities in the logged (26%) than the non-logged (8%) treatment. Mountain Bluebirds were usurped most often (n = 5), followed by Hairy Woodpeckers (n = 3) and Northern Flickers (n = 1). Red-headed Woodpeckers were unsuccessful in their attempt to usurp one Hairy Woodpecker and one Northern Flicker nest cavity.

I used backdating to estimate nest initiation for one cavity that was discovered after the egg-laying period in 2005. The cavity was originally excavated by Hairy Woodpeckers the year before and, according to field notes, was probably unoccupied before Red-headed Woodpeckers enlarged the entrance and began nesting. Red-headed Woodpecker pairs that usurped cavities initiated nesting earlier ($\bar{x}$ = 12 May ± 2 days, n = 9) than pairs that excavated cavities (18 May ± 2 days, n = 22; t = 2.04, df = 21, P = 0.054).

DISCUSSION

I predicted that incidence of usurpation would be greater in logged than non-logged areas because Red-headed Woodpeckers tend to nest in open habitats (Smith et al. 2000, Doherty and Grubb 2002). Incidence of nest usurpation versus construction was nearly identical between treatments, but Red-headed Woodpeckers nested more often and usurped a greater percentage of hosts in logged than non-logged areas, despite host cavities being more abundant in the control.

Red-headed Woodpecker pairs that usurped cavities initiated nesting earlier than pairs that excavated cavities. Early nesting correlates with larger clutch sizes in cavity nesting birds (Dijkstra et al. 1982, Nilsson 1991). The benefit derived from usurping a nest was possibly countered by the risk associated with interspecific conflict. For example, Northern Flickers and Hairy Woodpeckers aggressively defended their cavities from Red-headed Woodpeckers. However, Mountain Bluebirds were seldom seen defending cavities against Red-headed Woodpeckers and were usurped almost twice as often as Hairy Woodpeckers, despite nests of the two species having occurred at similar abundances on each treatment.

Interspecific competition can increase as nest site availability decreases among cavity nesters (Brawn 1990, Lindell 1996). It seems logical that the similarity in incidence of usurpation versus excavation on my study site could be explained by availability of nest sites between treatments. An examination of nest site selection and availability by Red-headed Woodpeckers was beyond the scope of this study, but may be influenced by abundance of burned aspen stands (Vierling and Lentile 2006) or large relatively isolated conifer snags (pers. obs.). Most Red-headed Woodpecker nests were in large ponderosa pine snags (excavated: n = 20, usurped: n = 6) rather than aspen stands which were rare across the study area and infrequently used (excavated: n = 2, usurped: n = 3). Better understanding of the importance of hardwoods and distribution of snags is needed before nest site availability can be used to explain incidence of usurpation by breeding Red-headed woodpeckers in burned ponderosa pine forests.

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